THESIS

on

SUPPURATION

of the

ACCESSORY CAVITIES of the NOSE

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SUPPURATION OF THE ACCESSORY CAVITIES OF THE NOSE.

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Introduction.

The subject chosen for this thesis, namely Suppuration of the Accessory Cavities of the Nose, appears to me to be one of great importance and any light thrown upon it which may lead to successful methods of treatment will be welcomed. This will be the case because it will afford relief to many who suffer the constant misery of a cold in the head, with the attendant nauseous taste in the mouth and foetid odour perceptible to themselves.

Again because it will enable the surgeon to prevent the onset of those serious conditions which may follow prolonged suppuration of the Frontal Ethmoidal or Sphenoidal Sinuses.

It will be immediately recognized what these may be when it is considered how very thin are the plates of bone which intervene between the sinuses and the brain and prevent the pus infecting that vital organ

It is only comparatively recently that much attention has been paid to affections of these access-ory cavities of the nose, although it is many years

since John Hunter so well described empyema of the antrum of Highmore and first suggested as treatment washing it out by means of its natural orifice in the nose. We read also that as early as 1675 Molinetti operated by making a crucial incision through the cheek and then entering the antrum through its facial wall.

Still it is really only during the last twelve years that Rhinology has made any very rapid strides in the direction of progress, the most important work being done by B. Fraenkel, Stoerk, Hartman, Schäfer, Desault, Küster Krause Luc&Jansen on the Continent, Bosworth, Solis-Cohen, Moreau Brown & Bryan in America and in this country Spencer Watson, Semon McBride, Greville Macdonald and others.

These names will be again referred to in this thesis as I discuss the treatment they have initiated and the results they have achieved.

In the earlier text books the condition is hardly touched upon and Spencer Watson (1875) is the first English author we find describing it as diagnosed by the aid of the nasal speculum and attaching importance to it.

Lennox Brown mentions in his book that while he was associated with Morell Mackenzie at the Hospital for diseases of the throat, Golden Square, London 1866 - 1873 he never saw a case. Recently while

(1) Throat and Nose and their diseases Lennox Brown P.626.

resident surgical officer there I had frequent opportunities of seeing these cases.

In the first place it will be necessary to glance at the general anatomy of the nose, the position of the natural openings from the sinuses into the nasal cavity and then to take each sinus by itself, discussing its anatomy and the aetiology, symptoms, diagnosis and treatment of suppuration within it.

GENERAL ANATOMY of the NOSE

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The cavity of the nose is divided into two lateral halves by a vertical cartillagenous septum, termed the septum nasi - Each half should present the same anatomical features -

The floor of the cavity is formed of the palatine process of the superior maxillary bone and the horizontal plate of the palate bone, it slopes slightly downwards from before backwards.

The roof is formed anteriorly by the nasal bones, in the centre by the ethmoid and posteriorly by the anterior wall of the sphenoidal sinus.

The inner wall is the septum nasi.

The outer wall is of most interest in the discussion - on suppuration of the accessory sinuses as here are the openings into them from the nose.

The outer wall is formed from the superior maxilla, the palate bone and the wing processes of the Sphenoid.[2] Zuckerkandl, makes a distinction between the upper and lower portion, the first reaching to the insertion of the inferior turbinated bone and the second below it to the floor of the nose.

There are three projections from this wall, the inferior, middle and superior turbinated bones.

The inferior turbinated bone is the largest, it is a thin bone attached to the superior maxilla and hangs free into the nasal cavity, between it and the floor of the nose is the inferior meatus of the nose, important to the Rhinologist as along it eustachian catheters and other instruments are passed.

The middle turbinated bone springs from the ethmoid and is situated higher up than the inferior and further back, between the two is the middle meatus of the nose. This space is important because it is here that are found the openings into the maxillary antrum, anterior ethmoidal cells and the frontal sinus, these lie in a groove called the infundibulum which leads out of the half moon shaped cavity called the haitus Semilunaris. The frontal sinus opening is at its anterior and upper part, that of the maxillary antrum at its inferior and posterior part.

(2) Zuckerkandl. Normale and Pathologische Anatomie der Nasenhohle .Band I Auflage 2.

The superior turbinated bone comes alsc from the ethmcid and is free at its posterior edge but becomes lost in the middle turbinated anteriorly.

Above the middle turbinated is the superior meatus of the nose in which are the openings of the posterior group of Ethmoidal cells. The openings into the sphenoidal Foramen sinus is above and behind the superior turbinated bones.

The Photographs No. I + II at the end show the general principal points of the anatomy of the nose, they are from sections made and prepared by myself, the situation of the cavities and their openings are marked by different letters. and marks

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MAXILLARY ANTRUM

ANATOMY.

The Maxillary Antrum will be considered first and I will now proceed to discuss the anatomy of it.

It is the largest of the accessory cavities of the nose and is situated in the superior maxillary bone lying on the side of the nasal cavity. When normal the antrum is in shape a three sided pyramid according to (3) Zuckerkandl and the sections represented in my Photographs Nos V shows this.

The points in the anatomy of this cavity that I

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(3) Zuckerkandl, Normale and Pathologische der Nasenhohle Band I. auflage 2 P. 251.

shall touch upon are those which have most important bearing in connection with suppuration. First it is well to bear in mind its close relation to the orbit, to the Alveolus of the upper jaw, to the nasal cavity and to the facial wall.

To the orbit on account of the injury that may be inflicted in making exploratory punctures or in operating to evacuate the pus from the antrum. Also that when there is bulging into the floor of the orbit it is well to examine for antral disease.

To the Alveolus, because in this are placed the teeth, pathological conditions of which play such an important part in suppuration of the antrum.

To the nasal cavity, for into this is the natural opening which allows the air to circulate in the antrum and also is the outlet for the natural discharge.

To the facial wall, because here there is sometimes swelling and tenderness which will aid in diagnoises.

The natural opening (Ostium Maxillare) from the antrum into the nasal cavity is situated in the outer nasal wall and opens into the middle meatus of the nose below the middle turbinated bone, in a channel called the Infundibulum. It is much above the floor of the antrum, a point to be noted in connection with the retention of discharge in the cavity.

The opening is generally elliptical in shape

but sometimes round or kidney shaped and its edges are somewhat thick. The shape is important as when slit like and the edges become inflamed they are more likely to come together and produce blocking of the opening than when it is circular.

Its proximity to the opening of the frontal sinus, which lies just in front of it, must be noted as this proximity often is the cause of suppuration from the one cavity affecting the other.

The walls of the Antrum in its interior are more or less ridged and this is important as the mucous membrane over these ridges is thrown into folds and must be carefully inspected and examined when operating for suppuration as it is in those folds that granulations ~~are formed~~ and other pathological changes more often occur.

The anatomy of the antrum varies in different skulls and even in the two sides of the same skull and the chief points for the surgeon to remember are that the cavity may be larger or smaller than normal, sometimes it is exceedingly small.(4) Table XXVI Fig. 2 & 3 in Zuckerkandl's work.(5) Westmacott read a paper before the Manchester Pathological Society in which he described variations in different antra and showed preparations he had made confirming his descriptions.

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(4) Zuckerkandl. Normale und Pathologische Anatomie der Nasenhohle Band I Auflage 2.

(5) Ditto Ditto
Ditto Ditto
Lancet Jan: 29th. 1898 P. 302.

There are several causes for a reduction in size. Thickened walls, bulging of any of the walls into the interior of the cavity and the overgrowth of the ridges before mentioned. Sometimes there are bony septa which divide the cavity into two or more parts, either vertically, horizontally or irregularly.

These variations must be remembered so that when the walls bulge inwards other cavities may not be open--ed into, such as the orbit or nasal cavity, when the antrum is being operated upon, and when there are sep--ta care should be taken to see that they are broken down and all the divisions evacuated of pus.

This should be borne in mind also on making an exploratory puncture as the needle might enter into a division where there was no pus and yet there might be pus in the antrum.

The cavity is lined with mucous membrane which is a direct continuation of that of the nose but is looser and composed of several layers, it strips off from the bone very readily.

AETIOLOGY.

The principal cause of suppuration of the Maxillary Antrum is I think undoubtedly some pathological condition connected with the teeth .

This is prominently brought to our notice when

we take into consideration the number of teeth whose fangs are only seperated from the cavity of the antrum by a very thin plate of bone, in fact in many instances the fangs of the molar teeth project into the cavity and are only covered by the periosteum and mucous membrane.

It may at first sight appear doubtful to the Rhinologist that this is the principal cause as numbers of patients attending his out patient clinic and private consulting room for this disease have really a good set of teeth. A reference to the table of cases at the end shows 13 cases with bad and 4 with good teeth and no history of dental trouble at all. We must however consider that the dentists treats a very large number of antral cases which never find their way into the Rhinologists hands and all of them due to the decay of the teeth. It must also be noted that Alveolar abscesses in connection with the teeth open into the antral cavity frequently and so infect it. A recent discussion at the local branch of the British Dental Association on the subject of Suppuration of the Maxillary Antrum, in which I was invited to take part, confirmed my opinion as to the principal cause of this disease. I was astonished to find how many cases were treated only by the dentist and came to the conclusion that the dentist sees more cases than the Rhinologist. In this

opinion as to the cause I am borne out by McBride,[6] Ball,[7] Lennox Browne,[8] Schech[9] and others while Zucker-kandl,[10] and Greville Macdonald[11] who also quotes Krause, Hartman, Gougenheim and others in favour of his opinion, have formed the conclusion that the most common cause is some pathological condition of the Nasal mucous membrane.

Certainly a number of cases do originate with an attack of Acute Rhinitis and are more common in these days of Influenza epidemics than formerly. The natural opening (Ostium Maxillare) in the middle meatus of the nose becomes blocked, its edges being swelled and inflamed and thus the exudation into the antrum is retained or at all events partially ~~is~~ so and becomes purulent.

In this connection one may state it is of rare occurrence, and especially in out patient work, to meet with complete blocking of the ostrium maxillare.

This opening may and often does become partially blocked by a nasal mucous polypus and from observa-

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(6) McBride. Diseases of Throat, Nose & Ear P. 345.

(7) Ball. Diseases of Nose & Pharynx 3rd. Edition P.259.

(8) Lennox Browne. Throat & Nose & their Diseases 4th. Edition P.626.

(9) Schech. (Blaikies Translation) Diseases of Mouth Throat & Nose P. 275.

(10) Zuckerkandl Normale und Pathologische Anatomie der Nasenhohle Band I auflange 2 P.296

(11) Greville Macdonald Diseases of the Nose P.172.

-tion I am inclined to believe that where nasal polypi are associated with suppuration of the antrum, they are the primary pathological condition and the suppuration is secondary and not vice versa as some suppose.

Traumatisn accounts for a few cases as one is liable to accidents from the earliest age,(12) Darcy Power reports the case of a child 8 weeks old with Empyema of Maxillary antrum due to the bruising of the cheeks with the forceps at birth. Operations, such as turbinotomy or the application of the Electric Cautery to the turbinate bones unskilfully performed may produce necrosis of the nasal wall, perforation and suppuration of the cavity.

Foreign bodies are another cause.

A case is recorded at the hospital for diseases of the throat, Golden Square, London, of a child three months old with Empyema of the Maxillary antrum. The child had two teeth showing when it was born and on their being extracted and the cavity opened to evacuate the puss the shells of two more were found in the inside.

Flies deposit their eggs in the Nasal cavity and produce suppuration but this is extremely rare in this country.

Syphilitic disease of the nose accounts for

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(12) Darcy Power. "Lancet" November 6/97. P. 1190.

some cases though it is not very commonly met with and malignant tumours inside the antrum sometimes break down and suppurate.

Infection from one of the other accessory Cavities may take place, more especially from the Frontal or the ethmoidal, the pus flowing along the Infundibulum and entering the antrum through its natural opening, the openings of the frontal and Max-illary sinuses being close together (See Photograph No IX) a point which Milligan (13) lays stress on in a paper on Diseases of the Frontal sinuses in the "Lancett".

SYMPTOMS & DIAGNOSIS.

I must now consider the symptoms and diagnosis of antral suppuration and I find a great difficulty in arriving at a definite diagnosis from symptoms alone, as the same are in the main common to all the accessory cavities - of course in the acute inflammatory condition with a completely blocked ostium maxillare when there is swelling of the cheek, bulging of the facial wall of the cavity, with intense pain and tenderness the diagnosis is easy but this is very rarely met with by the specialist and will only be noticed here.

(13) Milligan "Lancett" Feb: 19/98 P. 486.

All of my cases to which reference will be made had a patent ostium maxillare and exit for the pus into the nasal cavity.

The most constant symptom and the one which brings most of the patients to the specialist is the offensive discharge from the nose, either from the anterior or posterior nares.

As far as I have observed there is no difference in the discharge of the maxillary antrum from that of any other of the accessory cavities, though it has been described as having a smell peculiarly of its own, namely that of decomposing herrings.

I have seen some very offensive antra and have smelled a great variety of odours connected with them but can not say I have been able to identify them. The colour of the discharge is usually yellow, that being the colour in all the cases referred to in my table, whether antral or frontal.

The flow of the discharge is more or less copious according to the position of the head - Patients usually state that it is profuse in the morning when they first rise; this is on account of the opening being the highest part of the cavity and it fills during sleep and on rising and bending the head in the act of dressing, a large flow of pus escapes at once; and this also takes place during the day when stooping or writing.

The greatest flow occurring when the head is

bent down and towards the non affected side (10 ~~18~~ of the cases mentioned this) a fact which aids us in diagnosis, as if after cleaning the nostril well and instructing the patient to hold the head in that position for a short time, on examination with the Nasal speculum immediately afterwards we find pus in the middle meatus of the nose, or at all events a drop of pus which occasionally pulsates (14) (this was first ~~quoted~~ noted by Walb and is quoted by McBride) we may be almost certain that we have suppuration of the antrum, B. Fraenkel states that when the head is held in that position pus can not escape from the other cavaties.

In this I think from my own observation that he is wrong.

The fact that the discharge is unilateral is an aid in diagnosis as it generally indicates suppuration of the antrum in the adult just as in the child it indicates a foreign body up the nostril.

Sometimes both antra are however affected and then both nostrils have pus in them, though it often happens that when the discharge is excessive from one Antrum the pus flows round into the other nostril through the post nasal space.

If a flow of pus takes place after removal of a polypus from the middle meatus we may expect Antrum suppuration.

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(14) McBride. Diseases of Throat, Nose & Ear P. 347.

Blocking of the nostril is another common symptom owing to the swelling of the mucous membrane from the flow of the discharge over it (9 of my cases mentioned it.)

The patient generally perceives the smell of the pus and also has an unpleasant taste in the mouth The smell and taste occuring at intervals. The smell is noticed when a quantity of pus first comes through into the nostril and the taste occurs as a rule only in the morning on rising, due no doubt to the fact that while lying down the tendency is for the discharge to run down at the back of the throat, 1% of the cases reported noticing the smell and 1% having the bad taste in the mouth, 4 mentioning it was only in the morning.

Pain is by no means a constant symptom, out of my 14 purely Antral cases 7 complained of definite pain, the other 7 had none and only 4 complained of headache; When pain is present it is as often felt over the frontal region as over the cheek, this should be borne in mind in making diagnosis of the Frontal Sinus Suppuration, and it is extremely difficult if not impossible to differentiate this pain from ordinary neuralgia.

When the cases are due to extensive dental trouble there is usually severe toothache.

In some chronic cases there is swelling over the cheek, such a case in the out-patient department

of a colleague was presented to my notice the other day but it is not often seen.

On examination of the nose by aid of a nasal speculum and a good light we notice several conditions. The Middle Turbinated is usually swelled to a more or less extent and the tissues are generally con-gested; (15) McBride points this out, again, the mucous membrane may be pallid and sodden as mentioned by (16) Lennox Browne. I have observed examples of both conditions.

There may or may not be Mucous Polypi present, in my cases 5 of the purely Antral cases had mucous Polypi.

Granulation tissue is often seen in the middle meatus of the nose, round the opening into the antrum.

The condition described as "Cleavage" of the Middle Turbinate" and mentioned by (17) Greville Mac-donald as occuring in 7 of his tabled cases has not been present in any case observed by me, though carefully looked for - Pus is generally present but it may not be, even when the head is held in the best position to evacuate the antrum.

A posterior Rhinoscopic examination should always be made, as frequently pus is seen by that

(15) McBride. Diseases of Throat, Nose & Ear P. 347.

(16) Lennox Browne. The Throat & Nose & Their Diseases. P. 628.

(17) Greville Macdonald. Diseases of the Nose. P. 177.

means posteriorly in the middle meatus of the nose.

Other means of examination have been introduced to aid in the diagnosis.

Percussion of the teeth is extremely useful,.

The teeth may appear to be quite sound and yet there is mischief at the root as is pointed out by (18) Roughton in an article in the "Laryngoscope""the tooth may have a dead pulp and an alveolar abscess at the root", marked tenderness on percussion will be noticed in this condition. As to the different note produced when Antrum healthy or otherwise I have not been able definitely to elicit that, but one does not uncommonly meet with tenderness even where the teeth are sound.

Percussion with the finger on the cheek and up the side of the nose also at times will reveal tenderness but it is no reliable ~~no reliable~~ guide. -

Transillumination first suggested by Voltolini is carried out by placing an Electric Light in the mouth and then instructing the patient to close it , this of course must be carried out in a dark room, when if there be pus in the Antrum the cheek on the affected side will not be illuminated, McBride has devised a tube one end of which he places on the cheek and looks into the other end, this materially helps the examination. My experience after seeing a number of cases examined both in Vienna

(18) Roughton. "Laryngoscope" March 1898 P. 161.

and elsewhere is that it is unreliable, the percep-
-tion of light by the patient was the best guide but
even that gave an incorrect diagnosis at times.
The fallacy being that there may be opacity but no
pus, as Rhault once said "We can have opacity
without Empyema but no Empyema without opacity"
When one studies (19) Zuckerkandl's work on the anatomy
of these regions one does not wonder at it as the
Cavities vary so much in size, even in the same face,
and their walls vary greatly in thickness, the lamp
also may be at fault. (20) Westmacott also pointed these
variations out in a paper read before the Manchester
Pathological Society and he showed specimens as
examples.

Catheterization through the ostium Maxillare
may be practised,. I have had no experience of it
but it does not appeal to me as a desirable proceedure
as the opening is so high up and very near the orbit which
might be damaged.

Exploratory Punctures. These I have seen made
in four different situations, Viz:-

(1) Through the Alveolus, through
socket of a tooth.

(2) Through the Canine Fossa.

(3) Through the Middle Meatus of the Nose.

(4) Through the Inferior Meatus of the Nose.

(19) Zuckerkandl Normale und Pathologische Anatomie der Nasenhohle. Band I auflage 2

(20) Lancet Jan: 29/98 P. 302.

One must consider the best situation to make the puncture and also the instrument with which it is to be made.

With regard to position, my objections to the first are that you require a general Anaesthetic such as gas and in an edentulous jaw it is some-
-times difficult to enter the Autrum through the Alveolus.

The objection to the 2nd. is that here also you must admister gas as the facial wall of the Antrum is usually of a moderate thickness.

The objection to the 3rd. is that it is so near the orbit that mischief may arise from that structure being injured, such a case has come under my notice. It is also better to have the opening nearer the floor of the cavity so that if you use an exploring needle for the purpose of aspirating you may have the point in the pus and not above it and if you use a needle for the purpose of washing it out, it may be some little distance away from the natural opening through which you wish the pus to flow. My experience in seeing the middle meatus selected in Berlin and the inferior in Vienna made me draw the conclusion that the inferior meatus is the best position for the Exploratory puncture to be made.

The difficulties here are slight, those I have met with are an unusual thickness of the Nasal wall,

which is rare, and a piece of the bone blocking the needle on its way through so that syringing was prevented but this does not often occur. With proper antiseptic precaution there is little or no risk and though I have seen many Antra explored by this method I never saw any ill effects arise from it. It was practised in Chiari's Clinic in Vienna.

With regard to the instrument to be used, a perfectly plain straight needle as shown in the photographs Nos. III & VIII I have found most suitable, such is used in Vienna. It is about ~~five~~ 4 inches long and has an india rubber tube attached to the end so that you can insert the nozzle of a syringe into it and syringe through with some mild antiseptic lotion such as Boracic Acid, and the pus, if any, is washed out through the Ostium Maxillare. I prefer washing the Cavity out to aspirating the pus as sometimes it is thick and will not come through the needle.

This method gives little or no inconvenience to the patient if the inferior meatus be well Anaesthetised with cocaine. The needle is inserted at a spot about an inch (or an inch to a half) from the Anterior nares where the wall is usually found to be thin, the shaft is at (as) an obtuse angle with the wall as the septum will allow and the point is directed backwards and outwards. (See photograph No III)

After considering the symptoms and means of examination with regard to arriving at an accurate diagnosis, one comes to the conclusion that symptoms are not altogether to be relied upon and though in some cases they are so pronounced that no mistake can be made, in a very large number of cases there is only one way of arriving at an accurate diagnosis viz. by an exploratory puncture and as it is an easy matter, when there is doubt, should always be made.

TREATMENT.

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In treating suppuration of the antrum as in other diseases the cause must be first sought for and if possible ascertained and removed.

The teeth in every case should be examined thoroughly, and attended to, by removal or otherwise, if found defective.

Next the condition of the nose must be investigated, polypi if present removed and any other pathological conditions tending to affect the antrum treated.

Then the antrum itself must be opened into, drained and any cause that may be present in the cavity must be attacked.

On these points I think everyone is agreed

but when it comes to operative measures one is met with widely varying opinions.

It may be as well first of all to enumerate and describe the several operations, then to discuss their merits and demerits.

(1) Washing out by passing a Eustachian cathether through the natural orifice from the nose, either with or without the re--moval of the middle turbinated bone. This has been advocated by Michel, Stoerk, Hartmann and others.

(2) Washing out through an artificial opening made from the nose .(21) Mickulicz made his opening through the inferior meatus by means of a spear shaped knife. Solis Cohen made his through the inferior meatus with a drill and Krauze with a trocar and canula.

(3) Extraction of a tooth, Hunter years ago adopted this method and broke through the alveolus into the antrum above. This is done by a large number of Rhinologists and Surgeons at the present day; various instruments are used, hand drills and dental drills. If you have a dental drill driven by an Electric motor, this in my experience is the quickest and most

(21) Archiv f Klin Chir. 1887.

(3) convenient way of performing the operation cont:

Care should be taken not to penetrate the floor of the nose instead of the antrum, a diagram illustrating the proper socket of the molar tooth to drill through is well shown in "Laryngoscope" in a paper by Roughton.[22] If a tooth is decayed extract that, if all are healthy either the 1st. or 2nd. Molar.

In an edentulous jaw a little difficulty may be encountered in drilling through the alveolus but it is easily overcome with care. After drilling, a tube is inserted. Any number of tubes are made for the pur--pose of draining, some very elaborate with plates fastening them to the teeth and with plugs to take out and put in when required, the simplest and in my opinion the best is Ellis' spiral wire tube as it gives free drainage and is easily kept in its place.

(4) Through the canine fossa, recommended by Christopher Heath[23] and others.

Either a small opening may be made in this situation and a drainage tube inserted, through which the cavity may be washed out and drained. Or an opening may be made

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(22) Laryngoscope. March /98 P. 161.
(23) Heath. Transaction Odont. Society. Nov:/89 P. 38.

(4) cont: sufficiently large to admit of a thorough exploration of the cavity with the finger and also inspection either directly or with a modified form of endoscope. The tubes of the endoscope are shortened and a small mirror affixed as described by Bryan[24] and used by him.

The operation by making a large opening is performed after the patient has been anaesthetized and the upper lip retracted by an assistant. An elliptical incision about ¾ an inch long is made at the place where the mucous membrane is reflected from the superior maxilla to the cheek, a portion of the mucous membrane and perios-tium is removed and an opening through the bone is made either with a trephine, chisel and mallet or drill. A Cleveland twist drill fixed into an ordinary carpenter's brace acts very well indeed. Such a drill is used by Dr. Bond at the Hospital for diseases of the throat, Golden Square, London. A dental drill driven by Electrici-ty is the most convenient thing.

Jansen[25] describes removal of the whole of the anterior facial wall of the Antrum

(5) Another method is after performing the

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[24] Transactions American Laryngological Association. 1894. P. 157.

[25] Archiv f Laryngologie Bd. 1. 1894.

(5) operation through canine fossa just describ-
con: -ed an opening is made through the nasal wall into the nasal cavity, Scanes Spicer and Robertson made several punctures through it with a large trochar.

(26)
Bonninghaus makes a large opening removing a portion of the nasal wall & invaginating the nasal mucous membrane into the cavity of the antrum.

(6) Bertrand's operation, entering through the
&
(7) hard palate and Molinetti's in 1675, making an incision through the cheek and then perforating the bone may only just be men-tioned.

as described in operation No 4

After the cavity has been explored and any pathological condition found, such as granulations, polypi polypoid degeneration of mucous membrane or necrosed bone. These are to be scraped and got rid of. After this while patient is still anaesthetised it is as well to insufflate Iodoform and pack the cavity tightly with Iodoform gauze The best gauze for the purpose is called in Vienna Chiaris gauze, it is in a long roll, in a circular tin box, about an inch wide and the edges are treated so that it

(26)
Bonninghaus Archiv f Laryngologic Bd. 6 Heft 2. 1897.

will not unravel, consequently no bits are left behind. It also saves time as it does not require cutting being already the ~~required~~ necessary width.

Care should be taken in this operation also that septa if present in the Antrum should be broken down.

The after treatment is simple, the cavity is well washed out once a day and if possible the fluid should be made to pass through into the nose. For this purpose it is useful to put an india rubber teat on to an ordinary ball syringe, this fills up the opening made in the canine fossa and does not allow the lotion to escape that way, so forcing it through into the nasal cavity. This should be done gently as discharge is apt to be driven to higher sinuses if force is used.

The difficulty of sending it through to the nose may also be overcome by the patient lying down with head over to non affected side. A very mild lotion should be used such as boracic acid or Sanitas.

After washing out, the cavity should be insufflated with Iodoform, Iodol or Iodoform and boracic acid and then packed with Iodoform gauze, care being taken to fill -

up all the corners and irregularities in the cavity. The patient is better in bed for 24 hours after operation but unless some unexpected complications arise they may then get up.

The patient soon learns to attend to the washing out and packing and is able to do it with the aid of a looking glass.

The question now arises which is the best method to adopt.

If we could see these cases in their acute stage, or at all events in a very recent one there is no doubt that many would be cured by a small opening being made and the cavity constantly washed out with some mild anti-septic and astringent lotion.

The best in my opinion is a weak solution of Iodine. Pig Mandl. ℥ij to a pint of water. I saw it used in Vienna and case 16 in my table was treated in that way with excellent results, it should be used once a day and the other twice the cavity is washed out in the 24 hours, Sanitas may be used.

The opening should not be less than $\frac{1}{8}$ inch in diameter and I prefer it made through the canine fossa and a simple Ellis' drainage tube inserted.

My objections to the Alveolar opening is

that food finds its way through it into the antrum and though elaborate plates with plugs are made to obviate this I find that the plugs are left out when they ought to be in and vice versa.

I think the cavity is well drained just as well from the canine fossa as through the alveolus if you consider its position during the 24 hours, as during sleep it is as low as the alveolus, particularly if you instruct the patient to lie on the affected side. During the day also the head is being constantly moved about.

My objections to the opening through from the nose are that you have not good drainage, the floor of the antrum being lower than that of the nasal cavity (see photograph No. V) Also it is impossible for the patients to attend to it themselves.

The Rhinologist seldom receives these cases for treatment till suppuration has been going on some time and the mucous membrane inside the antrum has undergone such a change that it is perfectly hopeless to expect curative results from simply washing out, whatever drug you use, (photo-

graphs No. VI-VII shows sections of polypoid degeneration of the mucous membrane taken out of antrum in case 13 in my table) This is a good example of the condition one frequently finds.

It seems to me to be bad surgery to keep syringing up a dark hole, not knowing what the condition is in the inside. Especially when a not very formidable operation will throw light on the subject and show the condition that has to be dealt with.

If the mucous membrane is found in good condition it is very easy after packing the cavity once or twice as described above, to allow the opening to close down to about $\frac{1}{8}$ inch and then insert Ellis' Spiral tube and then wash out daily. The closure of the wound takes place very readily.

With regard to Jansen's operation, before referred to, I do not think it necessary to take away the whole facial wall of the Antrum and it would be almost certain to produce deformity.

In the operation of Bönninghaus the invagination of the mucous membrane from the nose, if healthy, will no doubt be a great help in reclothing the interior of the antrum with mucous membrane, but I do

not think it advisable to have such a large permanent opening into the nasal cavity as pieces of dry mucous and foreign bodies are apt to lodge in it and set up irritation. Here it may be as well to mention that there are two ways in which the antrum may heal after the operation, scraping, packing etc. Either the antrum may fill up with connect--ive tissue and become obliterated.(27) Bergeat mentions 2 cases of spontaneous healing of the antrum in this way and states after an artificial opening is made it may heal in an analogous way.

Or the mucous membrane may regain its normal condition.

This latter is undoubtedly the one to be preferred and should always be aimed at.

To sum up the treatment, I would put in a plea for an early opening being made through the canine fossa large enough to enable the surgeon to see what condition the interior of the cavity is in and to enable him to scrape away granulation, polypi, or anything that may be keeping up the discharge.

Some writers say go on washing out for two or three months first, but why go on for so

(27) Bergeat Munch. Med. Woch. Feb: 15/98.

long? when we bear in mind that in all probability the discharge has been going on for even a longer time than the patient tells you. (It is usually only a medical brother who comes to you with quite a recent attack.)

I do not mean to say that the exploring, scraping and daily packing will be certain to effect a cure but I think my tables of cases shows a good result, 4 cases being quite well when last heard of.

I think the results would be better if the surgeon could keep the patient under actual daily personal treatment.

From the hospital they were sent out usually at the end of a week having been taught to pack the cavity themselves.

Patients however do not always do this as it ought to be done, and they do not always keep the gauze in a clean place before using.

I must also mention case 16 which quite recovered, being treated by an alveolar puncture and washing out three times daily as referred to above.

FRONTAL SINUS.

-----cOc------

Suppuration of this Sinus is very commonly associated with suppuration of one of the other accessory cavities, a glance at my table of cases at the end of this thesis will show that there is not a single case of purely frontal sinus suppuration amongst them.

4 are associated with ethmoidal suppuration

2 " " " Antral "

2 with both antral and ethmoidal.

(see table of cases at end of thesis)

Following the plan adopted in discussing the maxillary antrum, I shall now proceed to consider the anatomy of the frontal sinus.

The frontal sinuses are placed in the frontal bone one at each side of the root of the nose lying behind the frontal ridge, above the orbit and sometimes extending their whole length.

They are formed by a splitting of the two tables of the frontal bone at the age of about 6 or 7 years, they are irregular in shape but may, like the maxillary antrum, be likened to a three sided pyramid, the base being the roof of the orbit.

They are separated from one another by a septum, usually bony but may be cartillagenous, this septum is often absent or at all events perforated and then

there is free communication with the sinus on either side.

The cavity of the sinus varies very much in size, not only in different skulls but in the two sides of the same skull and occasionally one or both are absent. (28) Zuckerkandl mentions this and also quotes several other anatomists on this point.

The walls of the frontal sinus vary, the anterior one being the thickest, in some cases extremely so, as the extreme prominence in the orbital ridge is oftener due to the thickness of the bone than to the size of the sinus behind it. The posterior wall is next in thickness but is not very thick. The inferior wall is the thinnest and forms the roof of the orbit. The lateral wall is formed by the septum already described.

The relations of the sinus must be noted. Posteriorly is the brain, below is the orbit and on the inner side is the other sinus, the ethmoidal and frontal ethmoidal cells.

The natural opening into the nose is not merely an opening such as is seen in the maxillary antrum but it is a short irregular canal and is situated in the middle meatus of the nose just in front of the bulla ethmoidalis and above and in front of the

(28) Zuckerkandl. Normale und Pathologische Anatome der Nasenhohle Band I. Auflage 2 P. 325.

opening into the Antrum (see photograph No. IX at end of book)

The cavity is lined with mucous membrane, a continuation of that from the nose.

I have now mentioned the position, boundaries and the relations of and variations in the cavities, also the natural opening into the nose, the im-portance of these must now be discussed.

First its opening into the nasal cavity is important on account of its shape as it oftener becomes occluded through inflammation than that of the maxillary sinus. Then its proximity to the maxillary opening is important because of the probability of infection from one sinus to the other.

Secondly, the variation in size of cavity must be taken into consideration when operating on the sinuses so that adjacent structure may not be injured.

Thirdly, it must not be forgotten that the brain is separated from it by only a thin partition of bone and all risk of infection spreading through this must be avoided.

Bulging of the posterior wall of the sinus due to distention of the cavity with pus may give rise to present symptoms in connection with the brain which will aid us in diagnosis. The bulging may take place, and more frequently does, through the floor of the sinus into the orbit as that is the

thinnest wall and then we see it.

The ethmoidal and fronto-ethmoidal cells are in direct connection with the frontal sinus and therefore sources of infection and one must consider the advisability of opening into them freely when operating for suppuration of the frontal sinus. At the meeting of the British Medical Association in Montreal Dr. J. H. Bryan[29] made a great point of these fronto-ethmoidal cells, stating that they belonged neither to the frontal nor to the ethmoidal cavities but played an important part when suppuration is taking place in either of the cavities as they are usually more or less affected. He also states they sometimes bulge into the frontal sinus, materially reducing that cavity in size.

Having considered the anatomy and its importance in connection with disease I will now begin the Aetiology of Suppuration in the frontal sinus.

AETIOLOGY.

There is not so much diversity of opinion amongst Rhinologists as to the principal cause of Suppuration of the frontal sinus as was pointed out with regard to the maxillary sinus.

Acute Rhinitis spreading to the sinus is

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[29] Bryan. British Medical Journal. Nov: 13/97.

answerable for a large number of cases. From the fact however that the opening into the sinus is at its lowest part or nearly so, the exudation drains away and there is not the same likelihood of retention and suppuration as in the antrum where the opening is high up in the wall of the cavity. And this in spite of the fact that the opening into the frontal sinus is a canal and not merely an opening as in connection with the antrum, therefore more likely to become blocked.

If the Acute Rhinitis be of Influenza origin there is more danger of suppuration.

The fact that a greater number of cases of frontal suppuration are recorded now than formerly I am inclined to think is in a great measure due to the Influenza epidemics. No doubt however the better methods of examination lead to many cases of the disease being diagnosed which hitherto would have been passed over.

With the frontal sinus as with the antrum it is not common to meet with Acute suppuration, blocking of the canal and retention, it is well it is not so when we consider the structures in relation to the sinus.

Chronic Cattarrhal Rhinitis also spreads to the frontal sinus and eventually the discharge becomes purulent.

Frontal sinus suppuration is most commonly

found associated with suppuration in one of the accessory cavities, chiefly with the ethmoidal, a glance at the table of cases at the end of the thesis shows no single case of purely frontal suppuration, everyone having suppuration either in the ethmoidal or the antral cavities, every case but two (Nos.1,5,6) having ethmoidal suppuration, and five having antral. (30) Milligan in a paper to the "Lancet" on Frontal suppuration lays stress on this. The connection between frontal and ethmoidal suppuration is not to be wondered at when the anatomy of the fronto-ethmoidal cells is remembered, this was referred to when discussing the anatomy (Page 25..) Abnormal formation of the openings of the frontal and maxillary sinuses, which lie close together (as is well shown in Photograph No IX.....) some-times leads to inter infection of the sinuses. Occasionally the groove from the duct of the frontal sinus leads right into the antral opening. (31) Milligan quotes Dr. Fillibrown of Boston, who reports finding such a condition in seven heads, in support of this.

The configuration of the parts renders it more probable that the antrum will be infected from the frontal sinus than vice versa, but (32) Milligan suggests that capillary attraction carries the pus as it flows from the antrum up the

(30) Milligan. Lancet. Feb: 19/98. 1898 P. 487.
(31) "Lancet" Feb: 19/98 P. 487.
(32) Ditto Ditto

frontal duct and I quite agree with him.

I think also that the constant sniffing practised by people with a discharge from the nose is very likely to convey the infection from the antrum to the higher accessory cavities.

When two or more of the cavities are implicated when the patient comes to you, it is almost impossible to say which was the starting point of the disease.

Infective fevers are another cause giving rise to inflammation of the mucous membrane and suppuration.

Syphilis, commonly the tertiary form, gives rise to necrosis of the frontal bone and hence suppuration within the cavity, it may spread also from the ethmoidal cells.

Traumatism as in numerous other situations in the body is a cause of suppuration.

Foreign bodies are a cause just as was noticed in connection with the antrum, snuff taking is said by some writers to be a cause. None of the cases I have seen have been snuff takers and the habit to a very large extent has died out in this country.

Polypi may produce blocking of the duct, leading to partial retention and suppuration though it does not seem to be so common as one might suppose. Five of the cases out of the eight in the table at the end had had no polypi.

SYMPTOMS & DIAGNOSIS.

------oOo------

In considering the symptoms of frontal suppura-tion the same difficulty is met with as in connection with the maxillary antrum.

As in the maxillary antrum a case with complete blocking of the duct, bulging of the sinus into the orbit or elsewhere and with intense pain, high temperature and swelling is easily diagnosed.

The difficulty lies however with those cases that the Rhinologist is oftenest called upon to treat, namely those of chronic empyema of the sinus.

The principal sign is the discharge down the nostril, generally unilateral as in the maxillary antrum suppuration though here also one meets with suppuration from both sinuses in one patient.

This discharge has no distinguishing feature, it is offensive in odour and yellow in colour but so is that from the other accessory cavities of the nose. The flow of the discharge is more constant than that from the maxillary antrum but it sometimes is intermittent.

Taking notice of the volume of the flow of the pus when the head is held in any one position does not seem to be any aid to diagnoses. I have thought sometimes that a quick nodding movement of the head two or three times in succession brings more pus into

the nostril but should like to test the accuracy of the observation on more cases before expressing a definite opinion.

Pain is a symptom but the pain from disease of the maxillary antrum is usually situated over the frontal region and this also is such a common seat of ordinary neuralgia that it is no reliable guide.

The fact that most patients describe a peculiar feeling of fullness in the frontal region and that the pain is much increased on exertion may help the diagnosis a little.

Darrack (33) noticed that following Empyema of the frontal sinus, in some patients there was an occasion--al sensation as of falling forwards, with loss of muscular co-ordination.

Thomas noticed in this connection that after blowing the nose and a discharge of pus from the nostril the feeling ceased.

Tenderness on pressure on the walls of the sinus is sometimes met with, particularly the orbital wall which is the thinnest. (34) Kuhnst emphasises the introduction of the little finger into the inner and upper corner of orbit while patient looks down--wards. This I think is unreliable and the tenderness by no means constant.

Temporary oedema of the eyelid and the frontal

(33) Darrack. Medical News. March 6/97 P.295.
(34) Medical Record. Aug: 7/97 . P.193.

region is occasionally present. I have seen one or two instances of this but the same condition may arise from other causes.

Thickening of the bone in this region may be felt but again this is found in connection with other diseases.

Swellings over frontal region or into orbit are sometimes seen in connection with the disease under discussion, while brain symptoms indicating pressure on that organ may be present. These are not common till a late stage in the disease and therefore are not much aid in diagnosis.

On examination of the nose the same conditions are met with as on examination in suppuration of the maxillary antrum.

There is pus in the middle meatus but the difference to be noted here is that as a rule when the meatus is wiped quite clean the pus collects again more quickly than it does in suppura--tion of the maxillary antrum.

There is swelling of the mucous membrane particularly of the middle turbinated bone and sometimes on the septum opposite it. (35) Milligan mentions this and I have observed it also. Polypi are met with and polypoid degeneration of the mucous membrane, there may also be granulations chiefly along the infundibulum.

Transillumination. I have never seen any very

(35) "Lancet" Feb: 19/98.

satisfactory results from this. Vohsen (quoted by Ball)[36] has shown in some cases it may be advantageously applied direct to the frontal sinus, the Electric Lamp is covered by a special india rubber cap, except in front, the uncovered part is applied to the inner part of the orbital arch.

The same difficulties apply to the illumination of this sinus as apply to illumination of the maxillary antrum and which have been stated (Page 18)

When the diagnosis lies between antral and frontal suppuration it is always as well, after carefully wiping the nostril to put the exploring needle through the inferior meatus of the nose into the antrum and wash it out.

When the antrum has been excluded it is almost impossible to differentiate between frontal and ethmoidal suppuration and as I have before stated I believe the two are usually associated with one another.

In one or two cases I have passed a tube through the natural opening and washed out the frontal sinus, this is much practised in Vienna. It is a difficult thing to do even after the removal of the anterior portion of the middle turbinated bone, and not altogether free from risk. One case (No. 16 in the table) I was very successful with as the tube passed in quite easily and I washed the

(36) Ball. Disease of the nose, 3rd Edition P. 275.

sinus out regularly by that means. The tube I have found the easiest to insert is the same pattern as those used in Vienna, it has a big curve like a prostatic catheter curve (see drawing at the end of thesis) it is a little difficult to tell sometimes if it be in the frontal or the ethmoidal sinus but the position of that part of the tube projecting from the nostril will be a guide. The patients' own sensations also give you information, when syringing it out with warm lotion they will tell you exactly where they feel the warmth.

To sum up, there is no one definite symptom that can be relied on, rather must the Rhinologist draw his inference from many.

TREATMENT.

Cases of acute suppuration of the frontal sinus should be treated by careful attention to the con-dition of the nasal cavity and frequent cleansings with a warm mild antiseptic lotion resorted to. Blocking of the frontal duct and consequent retention of pus in the sinus should be watched for and when it takes place an external opening immediately made into the sinus for its relief.

These cases however are somewhat rare therefore the treatment of the more chronic case will be

discussed at greater length in this thesis.

The great aim must be to keep a free passage from the sinus into the nasal cavity, for the purpose of drainage and the irrigation of the sinus with curative lotions. This may be accomplished by pass--ing a tube up the frontal duct into the sinus from the nasal cavity. Tubes bent at various angles have been reccmmended for the purpose, the one I have found to answer the best is the one described when discussing the symptoms and diagnosis. Although I had success with case No 16, I can not say I consider it to be a good method of treatment unless you can be assured that the case is of recent origin. Even then if the tube did not pass up the duct easily I should not make many attempts. It is only in a few cases that a tube can be passed up the frontal duct into the sinus, even after the removal of the anterior portion of the middle turbinated bone. I saw Chiari in Vienna have success with this method. Lichtwitz has also advocated it.

Another method is by making an opening with a trochar from the nose through the floor of the sinus. Considering the surrounding structures and the risk of injuring them, as you must necessarily be working in the dark, I need hardly say that the proceeding is to be condemned.

Mermod (quoted by Ball) (37) published a case where

(37) Ball. Diseases of the Nose, 3rd edition P. 278.

this method was adopted, the cranial cavity was entered, meningitis and death resulting. A subse-quent examination revealed the fact that the frontal sinuses were absent on both sides.

The next method to be considered is that of opening the frontal sinus externally.

There is some diversity of opinion as to the site of the opening. Some operators prefer the median line of the forehead just above the root of the nose, others make their opening in the line of the eye brow over the supra orbital ridge at its inner end.

Various instruments are used for the purpose, the gouge and mallet, chisel & mallet and trephine all have their supporters.

After the sinus is opened the mucous membrane may be curretted away, as some operators insist, or the cavity merely swabbed out with some astringent lotion, Chloride of Zinc, nitrate of silver etc, of varying strengths.

The passage into the nose is to be enlarged and free drainage into the nasal cavity established. On this point I think all agree.

The next points on which opinions differ are, whether if the external wound be left open for a time it is to be packed with gauze, or whether a drainage tube is to be inserted right through the external wound into the cavity of the nose and daily irrigation carried on

by that means till the purulent discharge has ceased. Luc (quoted by Milligan) (38) first originated this latter idea.

Another point of difference is the kind of tube to be used. I have seen both silver and india rubber ones used.

Then again, is the external opening to be closed directly the operation of exploring the sinus and establishing free drainage into the nose is over? the tube being left with one end on the floor of the sinus and the other end projecting down into the nose.

Further are the ethmoid cells to be opened up and free communication established between them and the sinus or not?
Kuhnt advocates the removal of the whole of the anterior wall of the sinus and Jansen the removal of its floor, these two are quoted by Ball (39)

Now to discuss the best method of procedure.

Although in treating the frontal sinus as in treating the maxillary antrum I must plead for sound surgery and an early external opening being made, so that a proper examination of the sinus can be made and the condition of its interior ascertained. I do not do this quite so readily as in the case of the maxillary sinus, the risks being so much greater.

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(38) Lancet Feb: 19/98.

(39) Ball. Diseases of the Nose 3rd edition P. 279.

At the same time the risks to the patient from prolonged suppuration of the frontal sinus are so much greater than of the maxillary antrum that I think after due consideration has been given to the diagnosis an early external opening should be made. The fact must always be kept well in the mind of the operator that the nasal discharge may be from the ethmoidal cells and that the frontal sinuses may be entirely absent, therefore extreme caution is to be used.

The position of the incision I advocate is over the supra obital ridge in the line of the eye brow at its inner end and my reasons are:- That the scar hardly shows at all after healing, if the wound be closed at once, and even if not there is very little disfigurement when it is allowed to close.

The opening into the bone at this point is very convenient for all purposes. (Cases No. 15, 18, 19, 20, 21, and 22 all had this incision).

The median incision leaves a visible scar and often the two sinuses are opened into which is unnecessary when the empyema is unilateral.
(Case No 17 had this opening made in the median line)

As to curretting the mucous membrane:-

If done at all it must be done with extreme care, the only case in my table of cases that was curretted to any extent was case No 18, but here the contents of the sinus were in such an offensive condition

that it was absolutely necessary to remove them. The objection to curretting the whole of the mucous membrane away is that the posterior wall of the sinus presents such a thin barrier to brain infection. Of course if there be carious bone, it must be removed.

Free drainage should be effected into the nasal cavity and considering the frequency with which ethmoidal suppuration is associated with frontal, the fronta~~l~~ ethmoidal cells should be opened up and free access given to them, both from the frontal sinus-es and the nasal cavity.

Of the varieties of drainage tubes in use an india-rubber one is the best on account of its flexibility.

As to leaving the external wound open and packing with gauze, as a rule it is unnecessary, Case 18. was kept open and packed daily, but then it was an old standing case and very foetid.

Case 21. was packed daily for about 10 days then a silver tube suitably curved was passed through the external wound into the nose and irrigation carried on by means of it. This not proving satisfactory the wound was again opened up and an india rubber drainage tube passed into the nostril and the external wound immediately closed up, after this the discharge diminished.

To sum up from the treatment of the cases in my table and after weighing the advantages and dis-advantages of the methods discussed here I would advocate an incision made at the inner end of the supra orbital ridge in the line of the eye brow, about

an inch long.

The periosteum carefully ~~carefully~~ reflected. An opening into the bone made with mallet and chisel.

The opening being sufficiently large for an examination of the sinus and its contents. Care must be taken to ensure opening into the sinus (the pul-sating of the mucous membrane of the sinus on being exposed is apt to be a little misleading, making it appear that it is the dura mater that is showing.)

A probe carefully sterilised and passed into the opening soon satisfies you as to whether it be the frontal sinus or not.

If it be the sinus the mucous membrane must be incised and examination of the sinus and its contents made.

The curette must be used or not at the discretion of the operator.

The sinus should be swabbed out with some weak antiseptic and astringent lotion.

A free passage should be made into the nasal cavity and the fronto ethmoidal cells communicated with.

A flexible india rubber drainage tube should be inserted, the tube to be made with a very thin circular flange which is afterwards cut the required shape (see drawings at end of thesis) so that it may rest on the floor of the sinus. The external wound is then closed, care being taken to suture the

divided periosteum together, and the wound dressed.

The after treatment is to syringe out the sinus through the drainage tube up the nostril, care being taken to use a syringe with a nozzle smaller than the lumen of the drainage tube, so that there may be an uninterrupted return flow. The syringing must be carried out very gently for a few days till the edges of the external wound have firmly united.

The lotion used in the cases in the table was either sanitas or weak boric acid (Cases Nos. 15, 19, 20 & 22) were treated in this manner and though not cured when last heard of, had greatly improved as reference to the table will show.

I found the drainage tube, described above, kept its place very well and did not slip down the nostril. There was also no difficulty in removing it when required.

Case No. 18. developed abscesses all over the scalp and finally meningitis resulted, it was treated with anti-streptococcus serum.- But not successfully.

ETHMOIDAL SINUS.

ANATOMY.

The anatomy of the ethmoidal sinus must now be considered.

Here is a more complicated arrangement than in

any of the other accessory cavities of the nose.

Hitherto there has been only a single cavity to deal with in each sinus, unless complicated by abnor--mal formations, the ethmoidal sinuses however are composed of a number of cells more or less completely separated from one another by bony partitions.

The ethmoid bone for the purposes of this thesis may be described shortly as (40) consisting of a horizontal plate which forms part of the anterior fossa of the base of the skull. A perpendicular plate which forms part of the nasal septum and two lateral masses of cells.

These lateral masses are the ethmoidal sinuses and are composed of a number of thin walled cavities, the ethmoidal cells. They are interposed between two verticil plates of bone, the outer one forms part of the orbit, the inner one part of the nasal fossa of the corresponding side.

These cells are usually spoken of as being in two groups, anterior and posterior, each group having an opening into the nasal cavity, the anterior opening into the middle meatus of the nose near the opening of the frontal sinus and the posterior group into the superior meatus of the nose (this latter opening is well seen in Photograph No I).

Bryan lays stress on there being another group

(40) Gray's Anatomy P.39.

of cells which he describes as neither belonging to the frontal nor the ethmoidal, namely the fronto ethmoidal cells. (these were referred to when discussing the frontal sinus, page 35)

Other points in the anatomy of the ethmoidal sinuses to be noticed are, their thin roof formed of the horizontal plate and separating the sinuses from the cranial cavity, the thin outer wall, which separates them from the orbit. (Shown in Photographs No. IV-V) and the posterior wall separating them from the Sphenoidal sinus.

Abnormal openings into the ethmoidal cells are met with at times, as (41) Zuckerkandl states; Into the Sphenoidal sinus and into the maxillary antrum.

There may be also communication with the frontal sinus and with the orbit.

The sinuses are lined with mucous membrane of a more delicate nature than that of the other accessory cavities of the nose.

AETIOLOGY

The causes of suppuration in the ethmoid cells are practically the same as those of the frontal sinuses (pages 35-36) it is therefore not necessary to ennumerate them again here.

Probably syphilitic necrosis of the bone is

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(41) Zuckerkandl Normale und Pathologische Anatomie der Nasenhohle. Band I Auflange 2.

oftener the starting point of suppuration in the ethmoidal than in the frontal sinuses.

Another cause is that owing to the character of the mucous membrane lining these cells, as Bosworth states[42], chronic inflammation develops a soft jelly like thickening of the tissue. This increases, giving rise to distention of the cells, blocking of the outlets and partial retention of the secretion which is profuse in this condition, then the formation of pus takes place.

Bosworth also goes on to point out that the soft jelly like or myxomatous tissue becomes in some cases pushed out of the cells and appears at the natural openings as small polypi[43]. He further states that he does not believe that the large proportion of polypi originate in the ethmoidal cells and quotes Zuckerkandl, to whose work I have also referred, as having proved the fact. My own experience is that when the ethmoidal sinus is the only cavity affected you do find generally polypi and in numbers.

A reference to the table of cases at the end shows that polypi were found in only three cases but two of these were purely ethmoidal and in the other cases the ethmoidal trouble was I believe secondary to suppuration of one of the other accessory cavities.

(42) Bosworth. Transactions of the American Laryngological Associations. 1894 P. 149.
(43) Bosworth. Transactions of the American Laryngological Associations 1894.

As in suppuration of the frontal and maxillary sinuses there is no really definite symptoms which makes our diagnosis certain in ethmoidal suppuration.

There is the usual train of symptoms such as discharge, pain etc, as mentioned in connection with the frontal sinus suppuration.

Some observers are inclined to believe that the pain associated with suppuration of the accessory cavities of the nose, is more usually felt at the top of the head in ethmoidal disease. I have not found it so. Certainly one of the cases of purely ethmoidal suppuration in the table at the end mentioned this fact but the other did not . (44) Bosworth mentions "Aprosexia" but I have found amongst hospital patients that it is a little difficult to note if their mental activity be less than normal for the particular individual, so I have no reliable information to offer on the point.

On examining the nose there is usually found more swelling of the mucous membrane present than when either the frontal sinus or maxillary antrum are alone affected.

I have noted more tenderness in the nasal cavity and a little more hesitation on the part of the patient to undergo examination. More frequently too polypi are seen and granulation tissue is nearly always present in the middle meatus of the nose.

(44) Bosworth Transactions of American Laryngological Association. 1894.

On posterior rhinoscopy being performed you usually see pus in two positions, in the middle meatus from the anterior cells and in the superior meatus from the posterior cells, the two groups being nearly always simultaneously affected, it certainly has been so in all the cases I have seen and I believe there is generally communication between them.

A method of diagnosis mentioned by Ball,(45) and which I have tried with some measure of success, is to pass a probe gently up between the middle turbinated bone and the septum into the cells and you will then see the pus trickle down the probe.

There may be bulging into the orbit.

This is the most common place to find pus forcing its way to when complete blocking of the opening into the ethmoidal cells has taken place.

This however can not be looked upon as of much diagnostic value unless in conjunction with other Symptoms.

Investigation as to the condition of the other accessory cavities should be made and by process of exclusion a correct diagnosis is often arrived at.

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(45) Ball. Diseases of the Nose 3rd edition P. 282.

TREATMENT.

The first thing to be done in treating ethmoidal suppuration is to pay strict attention to the nasal cavity. Remove very carefully all polypi of which there are usually a number.

All hypertrophied tissue should be removed and here as in the other cavities free drainage established.

There should be no hesitation about removing a portion or indeed the whole of the middle turbinated bone if there be the slightest sign of its obstruct--ing the flow of pus.

The nose must be cleansed frequently with some mild antiseptic. It is not so much the antiseptic as perfect cleanliness that is required and one can not impress this too much on the patient.

Gentle syringing with an india rubber ball syringe I have found most useful.

It should be done with a syringe whose nozzle leaves plenty of space round it when inserted into the nostril so that there may be no impediment to the return flow. If possible the patient should attend the Rhinologist every day for a week so that the parts may be cleansed by skilled hands.

The probe must be used and dead bone sort for.
(46) Zuckerkandl says that in this region you often feel roughened bone which is not dead bone and certainly I have experienced this (Case 24. in this table) afforded me an example. If there be any reason to suppose that the discharge is pent up or that the cavity is not draining freely, further operative measures should be taken, an opening made through its anterior wall and the partitions between the cells broken down.

(47) Bosworth quotes Schäfer and others as using the curette, for breaking down the trabeculae and Grunwald the sharp spoon while he himself uses the dental burr.

I have used a small ring knife somewhat after the pattern of Mayers ring knife and found it answer very well.

The punch forceps is a very useful instrument here at times.

Of course extreme care must be used not to injure surrounding structures and the operation must not be undertaken lightly.

It is in my opinion very seldom that much relief is gained unless some operative measure be adopted and the method I would suggest is the method advocated

(46) Zuckerkandl Normale und Pathologische Anatomie der Nasenhohle. Band I Auflage 2. P. 361.

(47) Bosworth Transactions American Laryngological Associations. 1894 P. 15.

above and by which the two cases Nos. 23 & 24 in the table were treated.

With regard to the instrument to be used I do not think it makes much difference as long as the operator has made himself skilled in the use of it.

SPHENOIDAL SINUS.

ANATOMY.

The last of the Cavities to be considered is the Sphenoidal.

It is situated in the body of the Sphenoid bone and is divided into two lateral halves by a septum. This septum projects beyond the cavities at the anterior and lower edge of the sphenoid bone, forming the Rostrum Sphenoidale.(48)

The two cavities formed by the septum are spoken of as the right and left sphenoidal Sinus and each has an opening into the nose situated just below the roof of the nasal cavity.

The opening(49) is a little above the centre of the anterior wall of the sinus (see Photo: No II) and not at the lowest part as in the frontal sinus.

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(48) Zuckerkandl Normale und Pathologische Anatomie der Nasenhohle. Band I Auflage 2 P. 335.

(49) Ditto Ditto

Zuckerkandl's table shows most of the openings he recorded were situated above the centre.

The opening in the bony wall is larger than that in the mucous membrane, thus a sort of diap--hragm is formed. It is important to remember this in connection with probable obstruction to the out--flow of exudation from the cavity.

The cavity of the sinus varies very much in size, sometimes is absent altogether.

Its important relations as far as this thesis is concerned are Anteriorly, the ethmoidal cells, into which there is sometimes a communication. Posteriorly, the cranial cavity, a thick plate of bone generally intervening.
Superiorly, with the cranial cavity but here the bony barrier is not very thick.

These relations must be remembered in connection with suppuration of the cavity and operative measures for its relief.

The cavity is lined with mucous membrane.

AETIOLOGY.

I shall not enumerate the causes of sphenoidal suppuration as it would be simply to repeat what has been gone over with regard to the frontal and ethmoidal sinuses. I think it is an extremely rare

condition. I have seen two cases both of which were of old standing that had been operated upon. The ethmoidal cells had been broken down and one large cavity made and the opening into the sphenoidal sinus was plainly seen.

From information I have gathered my opinion is that the most frequent cause is an infection from the ethmoidal cells.

SYMPTOMS & DIAGNOSIS.

The symptoms in this disease are not any better defined than in suppuration of the other sinuses.

Pain is said to be referred to the occipital region and eye troubles are reported in connection with suppuration of the sphenoidal sinus.

These were not present in the two cases I have seen.

The principal guides that most observers rely on are the complaint of the patient that he feels a dropping or trickling down the back of the throat. And that posterior rhinoscopy shows pus in the superior meatus of the nose resting on the upper surface of the posterior portion of the middle turbinated bone, an inspection of Photographs No I & II at the end of the thesis shows how this comes about.

In the photograph you have a good view of the relative positions of the opening into the sphenoidal sinus, the middle turbinated bone and the back of the throat.

TREATMENT.

I have had no personal experience of treating these cases but would suggest the same principle being carried out with regard to the treatment of the sphenoidal sinus as I have advocated in connection with the other accessory cavities.

If possible the natural opening should be enlarged in order to establish free drainage, as one must remember it is high up in the wall of the cavity and therefore retention of the exudation is very apt to take place.

In the case of the sphenoidal as in the frontal and ethmoidal sinuses extreme care must be exercised in proceeding to operative measures, as the space is a cramped one to work in and one must remember the vital importance it is that the surrounding structures be not injured.

-----oOo-----

In concluding I would draw attention to the annexed tables of cases which I have compiled from patients which

cases under my observation & care while Resident Surgical Officer at the hospital for diseases of the throat in Golden Square London.

Out of 24 Cases.

14 were Females.
10 were Males.

It is hardly fair to judge from such a small number of cases but from my experience in Vienna, Berlin & elsewhere I should say empyema of the accessory cavities of the nose is commoner in women than in men, certainly in respect to the frontal sinus.

The principal thing that brings patients to the rhinologist is the discharge from the nose

22 out of the 24 cases attending the hospital for that reason

17 complained of the offensive smell
16 " " " " taste

In this connection one does not appear to derive any aid in diagnosing which sinus is affected whether Antral, Frontal Ethmoidal or Sphenoidal as patients suffering from suppuration of any one of

them complain equally frequently of both offensive odour & taste.
13 of the antral cases had bad teeth which emphasises my contention that they are the principal cause of empyema of the antrum.
Polypi were associated with 4 cases.
Both the ethmoidal cases had polypi.
I think you usually do find them in connection with ethmoidal ~~disease~~ suppuration alone, when you have ethmoidal suppuration & no polypi one of other ~~of the~~ sinuses is generally affected & the ethmoidal suppuration is secondary.

A reference to the condition of the patients when last heard of, the duration of illness ~~prior~~ prior to attending the hospital & the treatment adopted, one sees that the more recent cases & also those which have been opened up fully are those ones that have yielded the most satisfactory results. In the antrum packing with gauze tightly & regularly certainly does good.
Case 16 however shows that in some cases entire relief may be effected by washing out through a small aperture with suitable drugs.

REFERENCES.

Authority.	Publication.	Page in Thesis.
Browne Lennox	Throat & Nose & their Diseases.	2, 16,
Bryan	Transactions of the American Laryngological Association 1894.	24,
" "	British Medical Journal Nov: 13/98	35.
Bonninghaus	Archiv f Laryngologic Bd. VI Heft: 2 1897.	25,
Bergeat	Munch. Med. Woch. Feb: 15/98.	30,
Ball	Diseases of the Nose	42, 44, 46, 55.
Bosworth	Transactions of the American Laryngological Association.	53, 54, 57.
Darrack.	Medical News. March 6/97.	40.
Gray	Text Book on Anatomy.	51.
Heath	Transactions Odont. Society. Nov: 1889.	23.
Jansen	Archiv f Laryngologie Bd. I 1894	24.
Kuhnt	Medical Record Aug: 6/97	40.
McBride	Diseases of Throat Nose & Ear	14, 16.

Macdonald Greville	Diseases of the Nose.	16.
Milligan	Lancet Feb: 19/98.	12,37,41, 46.
Mickulicz	Archiv f. Klin. Chir. 1887	22.
Power Darcy	"Lancet" Nov: 6/97	11.
Roughton	"Laryngoscope" March 1898.	17, 23.
Westmacott	"Lancet" Jan: 29/98.	7, 18.
Zuckerkandl.	Normale und Pathologische Anatomie der Nasenhohle. Band I Auflage 2.	4,5,7,18, 33,52,57, 58.

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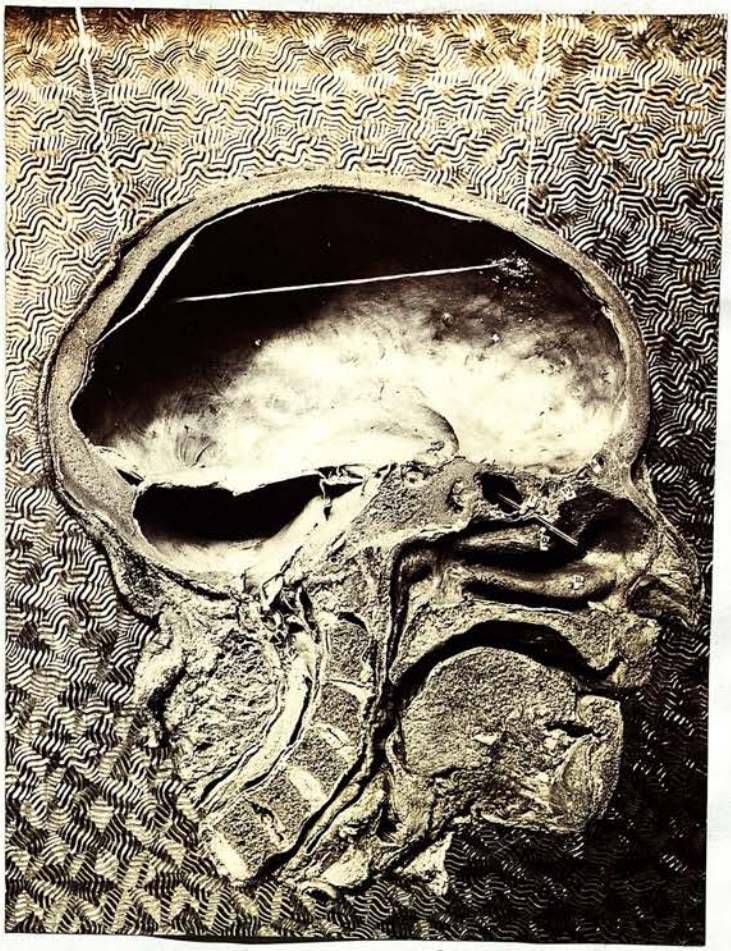
No I



This photograph is taken from a section made through a head as nearly as possible in the middle line It shows

The Inferior turbinated bone n

" Middle " " O

" Sphenoidal sinus just above the letter A

" Posterior ethmoidal cells t

" A glass rod is through their opening into the superior meatus of the nose.

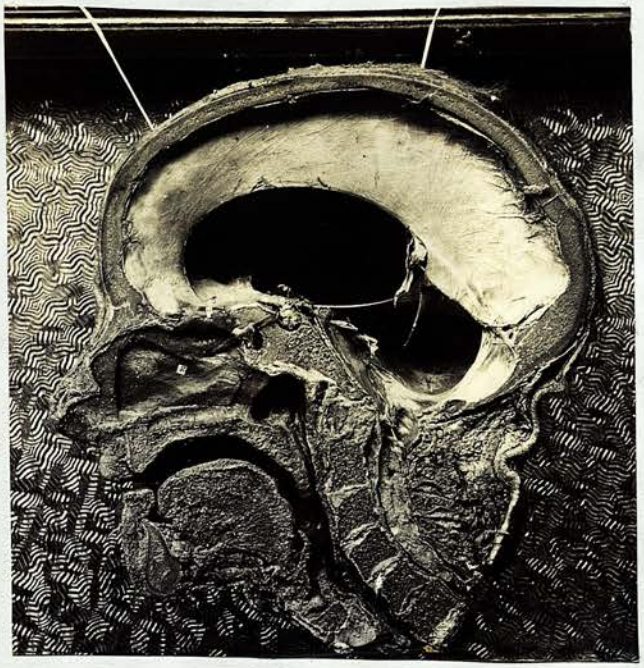
" Anterior ethmoidal cells m

Frontal Sinus S

an artificial hole has been made into it

The three meati through septum of the nose are also seen

No II



This photograph is the right half of the same head.

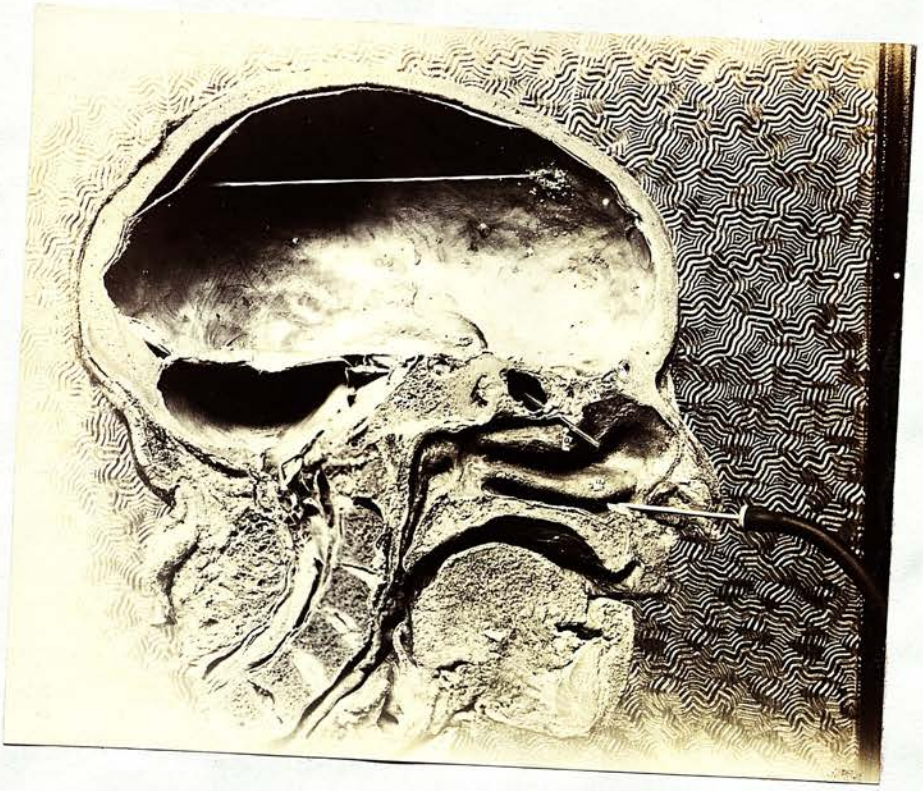
The Section not having been made quite in the middle line the left Superior turbinated is shown here turned upward

O

and a glass rod is through the left sphenoidal opening into the superior meatus & shows that it is high up in the anterior wall.

G. is the Septum Nasi

No III



This photograph shows the exploring needle in the antrum through the inferior meatus of the nose.

No IV

a b

c

d

This is a section through the bony skull & shows the relationship of the sinuses to one another & the thin plate of bone that intervene between the Sphenoidal sinus & the cranial cavity, also the ethmoidal cells & the cranial cavity

The line a points to the Sphenoid cavity
The line b to the ethmoid cells
The line c to the frontal sinus
The line d to the antral cavity

No. V

This photograph shows the shape of the antral cavity through which it is a section,

It also shows the relative position of the nasal floor & the antral floor, illustrating the difficulty of draining the antrum through the nose on account of the higher level of the latter.

The thin plate of bone between the antrum & the orbit & the ethmoidal cells & the orbit are well shown.

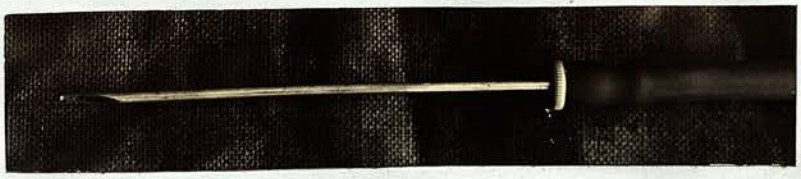
No VI

No VII

Shows the polypoid condition of mucous membrane
Taken from antrum in Case No 13

For these two photographs I am indebted to my friend Dr. Mc Glannahan.

No VIII



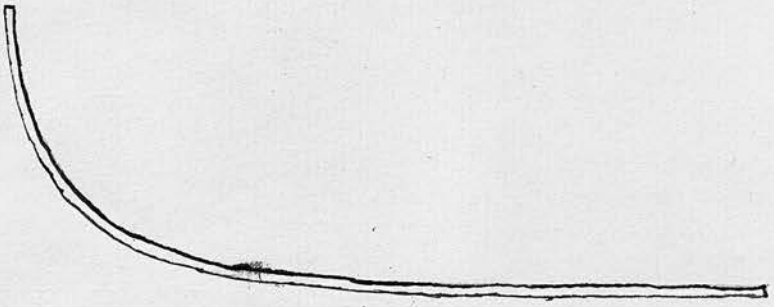
Exploring needle for Antrum

No IX

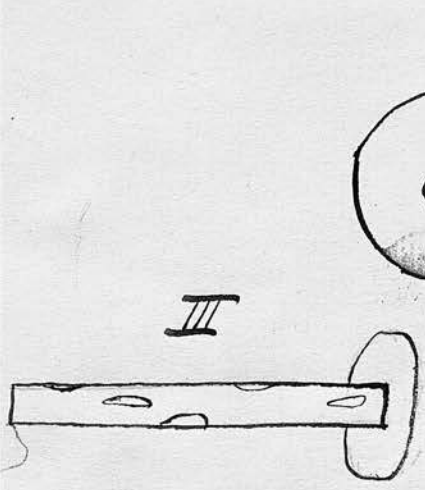
In this photograph the Nasal Septum has been turned up & the middle turbinated bone removed in nearly the whole of its length, showing the opening into the maxillary antrum & also into the frontal sinus.

The glass rod is through the central opening into the sinus

The pin was up the frontal duct but unfortunately it has slipped down a little



This a drawing showing the curve of the flexible silver tube which they use in trying for washing out the frontal sinus & which I have found useful.



This flange must be exceedingly thin

These drawings show drainage tube used for inserting down the nostril from the frontal sinus I is a ~~cross~~ view of the end of the tube. III shows whole tube with flange then as it comes from the maker II shows the flange cut when inserted. The two projections (-73-) catch on the floor of the sinus & hold in position yet do not hinder its withdrawal when necessary.

SUPPURATION of ANTRUM

No	Name & Age	Date	What complaining of	Duration of illness	One side or both	Discharge at back of throat	Colour of Discharge	Number of Handk'f's used	Smell	Bad taste	Discharge more when head in par-ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi
1	B.W. 21 M.	Oct: /96	Discharge from nose	4 months	Right side only	Not much	Yellow	2 a day	Yes	Yes	Yes when head bent forward	Yes	None	None	None
2	M.M. 22 F.	Feb: 26/96	Loss of voice & dis-charge from nose	Discharge from nose several years	Left side only	None	Greenish yellow	4-5 a day	No	No	Yes when head bent forward & downward	No	None	None	Yes
3	S.M. M.	March /96	Offensive discharge from nose	3 months	Right side only	None	Yellow	1 a day	Yes	No	Did not notice	No	None	None	None
4	F.F. 33 M.		Discharge from nose	4 months	Right side only	None	Yellow	3 a day	Yes	seldom	When head held downwards & on one side	No	Slight over Rt eye	No	One
5	G.L. 40 M.	Oct: /95	Discharge from nose	9 months	Both	No	Yellow	4-5 a day	No	In mor-ning first thing	Not noticed	A little	Unpleas-ant feeling behind eye	No	Yes
6	G.B. M.	Feb:	Discharge from nose	3 weeks	Left side only	None	Greenish yellow	1 a day	No	No	Not noticed	Slight	No	No	Yes
7	M.E. 24 F.	Aug: "96	Discharge from nose & back of throat	2 years	Right side only	Yes	Yellow	6-7 a day	Slight	Only first thing in morning	Not noticed	No	Yes pain over Rt eye	No	No
8	C.L. 37 F.	Early in/96	Polypi in nose & discharge	4 years	Both	Slight	Yellow	3-4 a day	Yes	Yes	Yes when head held downwards	Yes	No	No	Yes
9	M.W. 22 F.	Sept: /95	Constant discharge from nose	9 years	Both	Yes	Yellow	About 6 a day	Yes	Yes	Yes when holding head downwards	Yes	Yes over eyes & top of head & cheek	Yes	No

SUPPURATION of ANTRUM

	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth	Cold in Head	How long attending at Hospital	Condition when last seen & heard of (1) Discharge (2) Stoppage of nose (3) Pain (4) Headache	Treatment
e more d in par- position									
head bent	Yes	None	None	None	None	Yes Frequ- -ently	3 months	Quite well (1) None (2) None (3) None (4) None	Opened through canine fossa, interior of cavity examined & scraped after- -wards washed out & packed daily with Iodoform Gauze.
head bent & downward	No	None	None	Yes	Yes	No	7 months	Much improved (1) slight (2) None (3) None (4) None	Opened through Canine fossa interior of Cavity examined & scraped, after- -wards washed out & packed daily.
notice	No	None	None	None	Yes	Yes during Winter	8 months	Improved (1) Slight (2) None (3) None (4) None	Tooth extracted, drilled through Alveolus.
d held s & on one	No	Slight over Rt eye	No	One	Yes	No	6 months	Quite well (1) None (2) None (3) None (4) None	First Polypi removed & Galvano - Cautery applied then Antrum opened through Canine fossa interior scraped
ticed	A little	Unpleas- -ant feeling behind eye	No	Yes	Yes	Hay fever	13 months	Improved (1) Slight (2) None	Both Antra Opened through socket of tooth, wash- -ed out & packed with Gauze daily
ced	Slight	No	No	Yes	Yes	Yes const- -antly	6 weeks	Quite well (1) None (2) Slight occas- -ionally (3) None (4) None	Opened through Canine fossa, after- -wards washed out & packed with Iodoform Gauze daily.
ced	No	Yes pain over Rt eye	No	No	Yes	Yes	-	Improved (1) a little (2) None (3) None (4) None	Opened through Canine fossa scraped, & afterwards washed out & packed with Iodoform Gauze daily.
head held as	Yes	No	No	Yes	No	Yes	6 months	Improved (1) Slight (2) None (3) None (4) None	Polypi removed & both Antra drilled through Teeth sockets Elliss' drain- -age tube inserted & washed out daily
holding nwards	Yes	Yes over eyes & top of head & cheek	Yes	No	Yes	No	14 months	Rt. side well but only improved on left side (1) Slight on left side (2) None (3) Slight (4) Occasionally	Both Fossae opened but patient allow- -ed one to close & it had to be again opened they were scraped, washed out & packed.

SUPPURATION of ANTRUM

No	Name & Age	Date	What Complaining of	Duration of illness	One side or both	Discharge at back of throat	Colour of Discharge	Number of Handk'f's used	Smell	Bad taste	Discharge more when head in par-ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth
10	E.L. 21 F.	Jan: /96	Inflammation of nose	5 years	Right side only	Yes particul-arly on waking	Yellowish Cream colour	10 a day at times	Yes	Yes in morning	When head bent forward after rising	Yes	Yes in cheek & Jaw	Yes in Rt. temple	Yes a number	Yes
11	T.H. 33 M.	-	Discharge down back of throat	6 years	Both sides but more from left	Yes	Greenish yellow	2 a day	Yes	Yes	When head held downwards	Yes	In fore-head	Yes in top of head	No	No
12	J.C. 36 M.	-	Discharge from nose bad taste & smell in the morning	3 months	Left side only	Yes on rising	Yellow	3 a day	Yes	Yes	When head held downwards	No	None	No	No	Yes
13	E.H. 24 F	June /95	Discharge from back of throat	9 months	Left side	Yes	Yellow	3-4 a day	No	No	When head held downwards	Yes	Pain in left side of face	In temple at night	No	No
14	J.R. 72 F.	-	Discharge from nose	6 months	Right side	Slight in morning	Yellow	4-5 a day	Yes	Yes	When head held down	No	No	No	No	Yes

SUPPURATION of ANTRUM & FRONTAL SINUS

																SUP
15	E.J. F.	Nov: /95	Constant discharge from nose down right nostril	1 year	Right side only	Only when lying down	Yellow	3 a day	Very little	Only on rising in the morning	When in an up-right position	Yes on Rt. side	None	Yes begin-ning above Rt. eye	No	Yes
16	W.C. 20 M.	-	Discharge from nose	3 months	Left side	Slight in morning	Yellow	2 a day	Yes	Yes	When head held down	No	Yes Left side of face	No	No	Yes

					SUPPURATION of ANTRUM								
ber of dk'f's d	Smell	Bad taste	Discharge more when head in par--ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth	Cold in Head	How long attending at Hospital	Condition when last seen & heard of (1) Discharge (2) Stoppage of nose (3) Pain (4) Headache	Treatment	
a day times	Yes	Yes in morning	When head bent forward after rising	Yes	Yes in cheek & Jaw	Yes in Rt. temple	Yes a number	Yes	Yes frequ--ently	1 month	Much improved (1) Slight (2) None (3) None (4) None	Opened through Canine fossa & scrap--ed. Washed out & packed daily	
day	Yes	Yes	When head held downwards	Yes	In fore--head	Yes in top of head	No	No	Yes	6 months	Improved (1) Slight (2) None (3) Slight (4) Slight	Opened through Canine fossa, scraped, afterwards washed out & packed daily.	
day	Yes	Yes	When head held downwards	No	None	No	No	Yes	Yes	2 months	Quite well (1) None (2) None (3) None (4) Slight	Opened through Canine fossa, scraped, afterwards washed & packed daily.	
a day	No	No	When head held downwards	Yes	Pain in left side of face	In temple at night	No	No	Yes	8 months	Much improved (1) Almost ceased (2) None (3) None (4) None	Opened through Canine fossa, well scraped, afterwards washed & packed daily	
a day	Yes	Yes	When head held down	No	No	No	No	Yes	No	4 months	Much improved (1) Very slight (2) None (3) None (4) None	Opened through Canine fossa, washed out & packed daily.	
					SUPPURATION of ANTRUM & FRONTAL SINUS								
day	Very little	Only on rising in the morning	When in an up--right position	Yes on Rt. side	None	Yes begin--ning above Rt. eye	No	Yes	Occas--iona--lly	1 year	Much improved now (1) Very slight, tube still in	First Antrum drilled through Alveolus Elliss' drainage tube inserted washed out every day, Frontal sinus afterwards opened in orbital ridge tube passed into Nostril.	
a day	Yes	Yes	When head held down	No	Yes Left side of face	No	No	Yes	No	6 months	Quite well (1) None (2) None (3) None (4) None	Antrum drained through Alveolus Ellis tube inserted washed out daily. Tube passed into Frontal sinus through natural opening washed out daily for a week with weak solution of Iodine & also with Sanitas.	

SUPPURATION of ANTRUM & FRONTAL & ETHMOIDAL SINUS.

No	Name & Age	Date	What complaining of	Duration of illness	One side or both	Discharge at back of throat	Colour of discharge	Number of Handk'f's used	Smell	Bad-taste	Discharge more when head in par--ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth
17	M.B. 46 F.	-	Discharge from nose & stoppage	8 years	Both	Yes	Yellow	-	-	-	When head forward	Yes	Pain in forehead on both sides	Yes begin--ning in left eye	No	No
18	J.P. 45 M.	-	Discharge from nose with stoppage of nose pain in face & head	18 years	Both	Yes	Yellow	-	Yes	Yes	Yes when head held down	Yes	Yes espe--cially in fore--head	Yes begin--ning over eyes	No	Yes

SUPPURATION FRONTAL & ETHMOIDAL SINUSES.

19	E.D. 32 F.	Jan: /96	Discharge from nose & pain over right eye	3 months	Right side only	Yes when lying down	Greenish yellow	7 a day	Yes	Yes	Yes when holding head forward	Yes	Over Rt. eye & down side	Yes beginning over Rt eye.	No	No
20	L.J. F	Jan: /96	Pain over right eye & headache	8 years	Right side only	No	Yellow	-	No	Yes	No	Yes	Yes in the fore--head	Yes start--ing from Rt. eye	No	No
21	L.S. 23 F.	-	Profuse discharge from nose	5 years	Both	Yes	Yellow	-	-	-	When head bent forward	Yes	Pain over left eye	-	Yes	No
22	M.B. 17 F.	-	Stoppage of nose	2 years com--menced aft--er Influenza	Left side only	Yes	Yellow	5-6 a day	No	Only in morning	When head bent slightly for--ward	Yes	Pain in top of	headache at top of	Yes many	Yes

SUPPURATION ETHMOIDAL SINUSES.

23	H.C. 30 M.	Feb: /96	Nasal Polypi	8 years	Both sides	Yes	Greenish Yellow	2-3 a day	No	No	When head bent forward	Completely	No	No	Yes	No

S.			
umber of andk'f's sed	Smell	Bad-taste	Discharge more when head in par--ticular position
-	-	-	When head forward
-	Yes	Yes	Yes when head held down
a day	Yes	Yes	Yes when holding head forward
-	No	Yes	No
-	-	-	When head bent forward
6 a day	No	Only in morning	When head bent slightly for--ward
3 a day	No	No	When head bent forward

	SUPPURATION of ANTRUM & FRONTAL & ETHMOIDAL SINUS.							
Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth	Cold in head	How long attending at Hospital	Condition when last heard of (1) Discharge (2) Stoppage of nose (3) Pain (4) Headache	Treatment
Yes	Pain in forehead on both sides	Yes begin--ning in left eye	No	No	Often	-	Much improved (1) Still some (2) None (3) Slight (4) At times	Antra drilled Elliss tube inserted, washed out daily then frontal Sinus opened by trephine in middle line of forehead a rubber drainage tube down each nostril, washed through daily.
Yes	Yes espe--cially in fore--head	Yes begin--ning over eyes	No	Yes	No	-	Dead	Antra drilled, Elliss Tube inserted, washed out daily Frontal sinus opened pack--ed & opening enlarged through to nose. Abscesses opened all over scalp
			SUPPURATION FRONTAL & ETHMOIDAL SINUSES.					
Yes	Over Rt. eye & down side	Yes beginning over Rt eye.	No	No	Yes	4 months	Improving (1) Slight (2) None (3) Better (4) Better	Frontal Sinus opened & india rubber tube inserted down nostril, frontal wound closed up at time of operation
Yes	Yes in the fore--head	Yes start--ing from Rt. eye	No	No	Yes	2 weeks	Much improved (1) Slight (2) None (3) None (4) Only occasionally	Frontal Sinus opened & india rubber tube inserted down nostril. Forehead opening closed at operation
Yes	Pain over left eye	-	Yes	No	Yes	7 months	Improved (1) Slight (2) Occasionally (3) None (4) None	Frontal Sinus opened and packed for a fortnight then small silver tube kept in external opening, finally opening made freely into nose & india rubber tube passed through, external opening being allowed to close.
Yes	Pain in top of	headache at top of	Yes many	Yes	Yes	-	Improved (1) Slight (2) None (3) None (4) None	Frontal Sinus opened & tube inserted down the nose & left in, external open--ing closed at operation.
			SUPPURATION ETHMOIDAL SINUSES.					
Completely	No	No	Yes	No	Yes always appear--ed to have cold	10 months	Much improved (1) Slight (2) None (3) None (4) None	Polypi removed Ethmoidal cells scraped.

SUPPURATION ETHMOIDAL SINUSES.

No	Name & Age	Date	What complaining of	Duration of illness	One side or both	Discharge at back of throat	Colour of Discharge	Number of Handk'f's used	Smell	Bad taste	Discharge more when head in par--ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth	C H
24	E.V. 13 F.	Jan: /96	Stoppage of the nose & discharge	Several years	Both sides	Yes	Yellow	-	Yes	Yes	When head bent forward	Yes	Yes in forehead	Yes	Yes	No	Y

f e	Number of Handk'f's used	Smell	Bad taste	Discharge more when head in par--ticular position	Stoppage of Nose	Pain & Site of	Headache	Polypi	Bad teeth	Cold in Head	How long attending at Hospital	Condition when last seen & heard of (1) Discharge (2) Stoppage of nose (3) Pain (4) Headache	Treatment.
						SUPPURATION ETHMOIDAL SINUSES.							
	-	Yes	Yes	When head bent forward	Yes	Yes in forehead	Yes	Yes	No	Yes	6 months	Improved (1) Slight (2) None (3) None (4) Headache	Polypi removed Ethmoidal cells scraped & trabuculae removed